NASA Workshop:

Multi-dimensional Forested Ecosystem Structure: Requirements for Remote Sensing Observations

June 23-25, 2003, Annapolis, MD

March 17, 2004 Status Report

Co-chairs: **Robert Knox**, NASA Goddard Space Flight Center,
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Committee Members: **Sassan Saatchi**, NASA Jet Propulsion Laboratory,
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Bill Emanuel, NASA Headquarters/University of Virginia, and
Craig Dobson, NASA Headquarters

Goal — Community Participation

Goal

- ". . . bring together two research communities to help define NASA requirements for remote observations of multi-dimensional forested ecosystem structure: (1) scientists conducting research on the structure and function of forested ecosystems, and (2) scientists and engineers advancing methods for remote sensing of forested ecosystem structure.„

Results

- 60+ participants, 30+ institutions
  27 posters, 11 prepared talks
- Broad representation across remote sensing technologies - especially active methods (radar, lidar)
- Good cross-section of an ecological research community already using remote sensing in their studies
- Somewhat limited participation of
  - other field/lab scientists,
  - natural resource professionals,
  - commercial remote sensing specialists/firms
  - international colleagues

Objective 1 — Science Needs and Goals

"Clarify the scientific goals and requirements of measurements of multi-dimensional forested ecosystem structure, in the context of national and international research priorities for reducing uncertainties about global change, especially those uncertainties associated with the Earth's carbon balance. Address three components:

- Biomass and carbon
- Process studies and inferences about processes
- Biodiversity and habitat,,

Results

- Scientific goals identified
- Some quantitative requirements proposed
- Needs for requirements analysis discussed (*see workshop report*)
- Some qualitative priorities (biomass and carbon)
- Some quantitative priorities that require supporting analysis (process studies)
- Some needs listed without ranking (biodiversity)

Objective 2 — Remote Sensing Technologies

"Identify the most relevant air- and spaceborne remote sensing technologies for multi-dimensional structure characterization. Analyze opportunities, limitations, and current technical challenges. Address four relevant types of technological approaches:

- Lidar and related technologies
- Radar and related technologies
- Other emerging remote sensing technologies
- Fusion of lidar/radar with other emerging remote sensing technologies,,

Results

- Review presentations on leading technologies, journal articles planned (*special issue*)
- Fruitful breakout discussions with good summaries by rapporteurs
- Priorities identified for remote sensing science and/or clarifying capabilities
- Uncertain/diverse requirements left room for interpretation
- Limited time to discuss technological maturity and needs
- Fusion treatment somewhat cursory

Objective 3 — Developing a Plan

"Review methods to evaluate measurement approaches using a common set of science requirements and suggest appropriate next steps for NASA. Identify tools to assess how proposed measurements contribute to our ability to reduce global change uncertainties. Specific topics include:

- Protocols for evaluating existing measurement approaches and technologies
- Models that relate potential measurement suites to their value for science
- Priorities for near term actions, activities, and investments,,

Results

- Specific technology needs identified (*see workshop report*)
- Field/airborne campaigns for intercomparison proposed
- New spaceborne capabilities needed:
  - height ASAP,
  - forest structure observatory with change over time
- Some technology needs lack a clear foundation in requirements
- Limited time for task-oriented discussions (4th set of breakouts)

Workshop Products

Proposed

- Report

Endorsed at workshop or before

- Working group: Remote Sensing for Forested Ecosystem Structure
- Website for the Forest Structure Working Group and this workshop (www.foreststructure.org)
- Online collaboratory
- Journal special issue

Results to date

- Report draft complete, ready for review
- Working group: no formal proposal yet
- Website with workshop products and session records assembled, not yet public access
- Collaboratory not yet functioning, except as pre-public web site
- Special issue: needs a proposal to a journal (will be funding issues)

Workshop — FY03 Budget

Initial budget (with full travel support of 28)	$41,000
LBA loan (IFMP blackout period)	$40,000

RSIS estimate (WO #300-920-13)

• Labor (RSIS & WCI)	$10,369
• Travel	53,994
• Conference	12,835
• Materials, Equip., Misc.	482
• Overhead	3,710
• Total (including fee)	$81,390

Costs Reported

• Labor (RSIS & WCI)	$10,061
• Travel	19,610
• Conference	14,181
• Misc.	464
• Overhead	1,776
• Cumulative cost (through 2/04)	$46,091

RSIS Contract ended March 1